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THE PLACE OF AVIATION IN THE JUNIOR HIGH SCHOOL CURRICULUM

Submitted by

Douglas Francis MacDonald
(B.S. in Ed., State Teachers College
Bridgewater, 1942)

In partial fulfillment of requirements for
the degree of Master of Education

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Second Reader : J. Wendell Yeo, Associate Professor of Education

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INTRODUCTION AND STATEMENT OF THE PROBLEM

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CHAPTER I

INTRODUCTION AND STATEMENT OF THE PROBLEM

The purpose of this service paper is to determine from the recent literature :(1) the place of aviation education in the junior high school curriculum, and (2) the activities, materials, and methods which contribute toward the fulfillment of generally accepted air-age objectives. With but one exception, the literature consulted dates from 1942 to 1946, thus indicating the most recent ideas concerning air-age instruction.

The amount of attention given to the need of "aviation education" in the schools by newspapers, magazines, and professional literature indicates that at last aviation has been recognized as an omnipotent factor in everyone's life in the near future, if not in the present, and the schools' new duty is to prepare good citizens for an air world. Much of the literature, however, does not indicate in any way how the objectives of aviation education may be arrived at or how to go about "preparing good citizens for an air world."

Many popular articles report on what is being done or on what was done during the war, but all too often, the peacetime objectives are not made clear nor are the activities and methods varied or definite enough to meet the needs of

all pupils. Aviation education has been primarily vocational, like auto-mechanics, but perhaps there is a need for attitudes to be developed through subject matter in order to make children "....really conscious of the responsibilities (they) face in directing the use of air toward the upbuilding of a finer civilization." 1/

This statement by Engelhardt seems to express the general aim of aviation education and is agreed with by other authorities in the field. The articles concerning aviation education do not always mention the grade levels to which their objectives are applicable. There are, of course, some objectives that are suitable for all grades, many suitable for senior high school only, and some only for the elementary school. Not clearly defined are objectives for the junior high school, which is for many children the level where their academic training may end. It is not the purpose of this paper to try to develop a set of objectives for aviation education in the junior high school. Already a sufficiently large number for all grades have been developed by authorities in the field of aviation education, and by other research studies, so that by presenting their lists of objectives, we may determine the most suitable ones for junior high school.

1/ N.L. Engelhardt, Jr., "Air-Age Education Number", Education, 64:583-631.

A service paper by Howard S. Millett[1/] lists objectives in a rank order of importance arrived at as a result of a survey made among educators and businessmen. The first forty of these 250 objectives are as follows:-

Each pupil should know that:

1. Post-war era and planning for international relationships are based to a large extent on the development of air routes.

2. Airplanes serve to relieve suffering that follows plagues, fire, and earthquakes.

3. International barriers are broken down by the use of airplanes.

4. The airplane is here to stay and will play an increasingly important part in our everyday lives.

5. Planes will work startling changes, shifting populations and stimulating backward regions.

6. Planes have radically altered military methods.

7. Only intelligent and free use of the air can lead to the progress of mankind.

8. Aviation is a force in human living.

9. American aviation is now federally controlled.

10. Amphibians travel on land and on water.

11. Principal materials used in the construction of a plane are steel, aluminum, magnesium, plastics, copper, and wood.

12. The various forms of aircraft may be classified as: lighter-than-air aircraft; heavier-than-air aircraft, and amphibian aircraft.

1/ Howard S. Millett, "250 Objectives of Post-War Aeronautics", unpublished Service Paper, Boston University, School of Education, 1944.

[illegible]

[illegible]

[illegible]

13. Lighter-than-air aircraft consist of dirigibles and non-dirigibles.

14. Heavier-than-air aircraft consist of water and land planes.

15. Atmospheric pressure at sea level is 14.7 pounds per square inch.

16. Changes in weather result from changes in temperature, heat content, pressure, and humidity.

17. The distance from the ground to the base of the nearest cloud formation is defined as ceiling.

18. The air age will bring a revision of general and vocational education.

19. Air power will play an important part in peace settlements.

20. The spread of disease will become greater by increased use of the airplane.

21. Aviation education is a force that must be considered with all its ramifications in all teaching areas.

22. Every high school graduate from now on should have a background of the basic concepts of aviation and flight.

23. Aerography must supplement geography.

24. The principles of flight must be understood by each individual.

25. World travel will be very greatly affected in the future by aviation.

26. Sound geographical considerations provide the bases for international security and world peace.

27. The implications for future social changes are almost limitless.

28. The principal parts of a plane are the fuselage, propeller, wings, landing gear, engine, and empennage.

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29. Dead reckoning is the method of flying by charts and compass.

30. Piloting is getting to one's destination by means of landmarks.

31. Heat is transferred from one place to another by convection, conduction,or radiation.

32. A contour line on a map is a line passing through points of equal elevation.

33. Rising air expands and becomes less dense.

34. Air is composed of 78 per cent nitrogen, 21 per cent oxygen, and 1 per cent principally carbon dioxide....

35. Friction is the resistance of one body to slide over another.

36. The study of the air, clouds, troposphere, and stratosphere must be commonplace.

37. The family plane will become a reality after the war.

38. Man lives at the bottom of an 'ocean of air' of indeterminate depth.

39. Lines on a weather map that join points of equal pressure are isobars.

40. Lines on a weather map that join points of equal temperature are called isotherms.

Authorities in the field of aviation education have compiled lists of objectives considerably less in number than 250, and have made each more inclusive and adaptable to more levels. Engelhardt's major objectives of education

for the air age are:[1/]

Every citizen should:

Be fully cognizant of the significance of flight.

Understand the attributes of airplanes, and the actual and potential contributions of flight to civilization.

Have a fundamental understanding of the nature of the air ocean, the characteristics of air, and the basic principles of flight.

Know something of the history of the development of the airplane.

Understand that flight represents the accomplishment of a dream of men throughout many centuries in order that there may be full appreciation of the significance of flight.

Know how transportation has influenced the development of society and man's tendency to move from place to place.

Be able to discuss the ways in which air transportation can be directed toward beneficial progress of society.

Appreciate the issues involved in creating freedom of the air.

Be able to discuss intelligently questions related to the organization of the air world and global relations in the Air Age.

Understand how the airplane is increasing the interdependence among peoples of the world.

Understand the place of aviation in his community and appreciate the potential impact of the expanded use of air on community growth.

Appreciate the arts of the air- universality, freedom, lightness, and speed.

1/ N.L. Engelhardt, Jr., "Major Objectives of Education for the Air Age," Into the Air Age. New York: Air Age Education Research, 1944, p.30.

Understand how the airplane has extended the frontiers of good living by opening up the interiors of continents and establishing new transportation routes.

Appreciate how the airplane has aided man's adaptation to his physical environment.

Appreciate the cultures and languages of other peoples who have become our neighbors in the Air Age.

Know something about the occupational possibilities in air transportation and aircraft manufacturing.

Have a knowledge of the geography of the globe and its relation to world-wide air transportation.

Be familiar with the literature of the air and flight.

The First Denver Congress on Air-Age Education, held at the University of Denver in the summer of 1945, placed its....

> entire emphasis....on narrowing the gap between technical achievement and the social, economic, political, and cultural adaptation of such discovery to human welfare. The actual technological problems of aviation, which have recieved prime emphasis all during the war, were not studied. ....Geography, Socio-Economic Institutions, Aero-Politics, and Cultural Relations were the chief headings under which the problems were discussed. 1/

Hambrook, 2/ in an article entitled "Aviation Education Fundamentals" states that we must have definite aims in mind before we can have successful aviation education. Aviation education in the schools should:

1/ "Denver Congress Leads in Air-Age Planning", Air Age Education News, September, 1945, 3:3-6.

2/ Robert W. Hambrook, "Aviation Education Fundamentals," National Association of Secondary-School Principals Bulletin, No.115, 27:25-35.

.... supply general information on aviation

.... provide vocational guidance in aviation

.... supply the basis for a leisure-time activity

.... provide basic information and training in preparation for entering an aviation occupation

.... give ground course information for those expecting to fly

.... generate aviation interest

.... show what aviation has done in eliminating distance

.... realize the importance of air power.

Slye's [1] opinion is that it is the opportunity and the responsibility of education to "....train pupils to cope with the problems of air travel" and to develop the following:

A better understanding of the significance of the new world community created by the airplane.

A better understanding and a keener appreciation of the speed, safety, and comfort of flying today as contrasted with transportation in the past.

Attitudes of neighborliness with distant people through the new sense of nearness in time and space through aviation.

Realization of the usefulness of air transportation to ourselves and to the world in carrying people, mail, express, and freight speedily.

Understanding the new conception of global geography and its significant implications.

A better understanding of the interaction of man and his physical environment.

1/ Bertha E. Slye, "Opportunities and Responsibilities of Educational Leaders in a Social-Scientific Age," National Association of Secondary School Principals Bulletin, No.128, 29:53-58.

.... [illegible] general [illegible] of aviation

.... [illegible] [illegible] [illegible] in [illegible]

.... [illegible] [illegible] [illegible] [illegible] mobility

.... [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

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A new sense of responsibility for good citizenship in a new world community.

The foregoing lists of objectives are representative and inclusive of those proposed by most of the writers on the topic of aviation education in the schools. Which ones, specifically, are best for the junior high school or which ones are not applicable to junior high school, we may discern in trying to answer in the following chapter the questions which are raised by implication in some of the articles. These questions are generally similar in idea to the following:

What kinds of attitudes and understandings do we want developed in pupils and how will we develop these ?

Should the war-time vocational approach be de-emphasized and a general-knowledge program instituted ?

How far should we go in guidance in relation to aviation?

Should aviation be taught separately, or integrated with one or more other subjects ?

With these questions in mind and the lists of objectives as guides, a problem takes on added significance.

Assuming certain major air-age objectives(from the literature) what activities, materials, and methods then, will contribute toward fulfilling these objectives in the junior high school and what will be their place in the curriculum ?

CHAPTER II

ACTIVITIES, MATERIALS AND METHODS ADAPTABLE TO JUNIOR-HIGH-SCHOOL LEVEL

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ACTIVITIES, MATERIALS AND METHODS ADAPTABLE TO JUNIOR-HIGH-SCHOOL LEVEL

The war-time idea of having aviation education a matter entirely apart from the remainder of the curriculum is sharply criticized from many quarters. The opinion is expressed that activities and materials concerned with aviation should be "....added, infiltrated, or weaved into the existing curriculum....(in order to) ....develop a general awareness of aviation....and its significance to everyday living." 1/

Hart 2/ recommends the "sparking" of any school activity by associating it with aviation in some relationship.

"The inclusion of aviation materials in the curriculum cannot be overlooked," states Engelhardt. 3/ "The three-

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1/ Cornelius H. Siemens, "Developments in Aviation Education", California Journal of Secondary Education 19: 259-65.

2/ F.W.Hart, "A Program for Improving Aviation Teaching", California Journal of Secondary Education 19: 314-317.

3/ N.L.Engelhardt, Jr., "Air-conditioning Education", American School Board Journal 106: 46-47.

dimensional world....represents a new sphere of educational activity. ....Old texts should be supplanted by new ones with an 'air-age' outlook as soon as possible."

An article reporting an extensive investigation made by the Stanford School of Education on children's questions on aviation showed an extremely wide range of interests. The author concludes:

> Aviation education in the junior high school must not be a narrow pre-flight aeronautics type of thing....Aviation education must be considered broadly as education fitting young people to live in a world influenced by the modern airplane..... The social studies and natural science teachers should develop curricula to include the social and economic aspects of aviation education.... 1/

Burnett 2/ is also definitely opposed to using aviation just as "camouflage for boring material."

This last statement, implying that aviation activities are sometimes used as "camouflage for boring material", but should not be thus used, is disagreed with by other writers, Hart, 3/ Siemens, 4/ 5/ who believe that it is worthwhile to use aviation as incentive for any part of the curriculum with which it is possible to show some relationship.

1/ R.Will Burnett, "P-38's in the Junior High Curriculum," California Journal of Secondary Education, 19:287-91.

2/ Ibid.

3/ F.W. Hart, op. cit.

4/ Cornelius H. Siemens, op. cit.

5/ (Cornelius H. Siemens,) "State Plans of Aviation Education," National Association of Secondary School Principals Bulletin, 28:12-185.

[illegible]

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Although Activities, Materials and Methods are in many instances overlapping topics, for purposes of discussion here they will be considered separately, according to which topic the information appears to be primarily concerned.

ACTIVITIES

In discussing activities adaptable to the junior-high-school curriculum that would aid in fulfilling the air-age objectives listed in the first chapter, let us first consider them in relation to the traditional subject-matter set-up.

1. Contributions through Mathematics.-- An activity that could be included in the arithmetic program and also related to the geography subject matter is suggested by Engelhardt in "Watch Your Watch at 500 Miles an Hour." [1/] Freaks of time which will baffle the air traveler of the future and at the present time complicate long distance traveling even at approximately 250 miles an hour are presented the pupil by means of airline timetables and doing problems involving actual travel time and departure-arrival time. The pupil will derive some idea of the following possibilities:

> Nights will vary in length from an hour to twenty hours. Not infrequently people will travel over long distances where every stop will be at breakfast time. [at 500 miles per hour].... If you were in California, you would actually be four times as far from New York as a person in New York is from California, measured in business time.

1/ N.L. Engelhardt, Jr., "Watch Your Watch at 500 Miles an Hour", Air Age Education News, January, 1946, pp.3-5.

> If you were in London, you would be two hours from New York, but a person in New York would be twelve hours from London. It will take no business time to go from Tokyo to New York, but to go from New York to Tokyo will require almost twenty-eight hours. ....
>
> In response to a telephone call the night before, an executive could leave New York at 9:00 A.M. and arrive in California at 11:00 A.M. in ample time for luncheon. But a Californian under similar circumstances, could leave at 9:00 A.M. and would not arrive in New York until the dinner hour..... You could fly from Tokyo to New York leaving at 8:00 A.M. and arrive in New York for breakfast the same day,.... but to go from New York to Tokyo you could leave at 9:00 A.M. and would not arrive until 10:28 P.M.
>
> Breakfast in New York and dinner in London is a myth and will continue to be until airplanes travel at least 1000 miles per hour. But breakfast in London and lunch in New York is quite possible even today,when airliners go about 250 miles per hour.... Now why should the English have this advantage over New Yorkers ? Why should New Yorkers have the advantage over Californians ? 1/

After working out various problems like the preceding which prove that there are many freaks of time, the pupils continue with different projects to determine what causes these. Many combination arithmetic-geography lessons may be constructed to present the information involved in developing "time consciousness."

2. Contributions through Correlated Activities.-- An article entitled "Aviation Project in a Junior High School" 2/ reports

1/ N.L. Engelhardt,Jr., Ibid.

2/ Muriel G. Palmer, "Aviation Project in a Junior High School," California Journal of Secondary Education, 19:292-4.

on the presentation of an "air show" as the concluding activity after spending some time on the collection and accumulation of all kinds of objects, magazines, pamphlets, and books pertaining to the subject of aviation. Exhibits of aircraft models were arranged and films and film strips were shown. In the situation being reported, the pupils formulated their own objectives, dramatized scenes, demonstrated with home-made objects, maintained their own specialized library, drew diagrams and charts, and even tested and reviewed by such ideas as the "Sky Quiz." The final activity, as mentioned above, consisted of presenting an "air show" which included an exhibition of all the material covered by means of experiments, demonstrations, diagrams, and other methods.

Another successful activity disclosed by Cristiano in "Junior High School Aviation Project" [1/] is that of a school which set aside a special room, called it the "Aviation Reference Room" and provided for the participation of all pupils in all departments in redecorating the entire room with an aeronautics motif, including planets and constellations painted on the blue ceiling in correct positions and models and projects all along the walls. When the room was completed, it was used as an aviation classroom, reference library, and aviation workshop.

1/ Charles G. Cristiano, "Junior High School Aviation Project," High Points, 25:65-8.

3. Contributions through English.-- The last two activity programs overlap most of the traditional subject-matter areas, parts of the unit being included in almost all classes. Many other possible activities,however, may be carried out within one class, where it might not be possible to relate the aviation activity with other subjects. A program suggested for an English class is "Air-Age Integration for English" by Rutan.[1/] Although this was performed at high-school level, it may with a few adaptations form the basis for a junior-high-school English activity.

> Since....students are 'air-minded', the problem for the teacher of English is to improve the students' use of English by means of their interests in aviation. Simultaneously, students can extend their knowledge of aviation and improve their skill in reading, writing, speaking and listening.
>
> The following outline is offered as a series of suggestions which can be of help in obtaining an understanding and appreciation of the relation of aviation to life through English as a means of communication. Thus a class should not be concerned merely with explaining clearly why an airfoil can glide, but also with the effects the application of that principle has had, is having, and may have on people.

1/ Edward J. Rutan, "Air-Age Integration for English," Air Age Education News, September, 1945, p.7.

Introduction

General Discussion Questions....

General Exercises for Interpretation....

Activities

Vocabulary and Word Study

1. Learn the meaning, pronunciation, and spelling of such key terms as aviation, airfoil, aeronautics, airodynamics, aileron, fuselage, altimeter, empennage, fin, glide, etc.

2. Be able to distinguish between the technical and the general definitions of such words as: drag, lift, spar, strut, thrust, weight, etc.

3. Compile lists of the 'slanguage' of aviation, or prepare a picture pocket-dictionary of aviation.

4. Try to find what the different sensesof meaning of the word 'air' are.

5. Point out the difference in what is being said in these pairs of statements:

    a. Their ceiling is low.

    b. The ceiling is zero.

    a. Has he contacted him yet ?

    b. Has he said 'contact' yet ?

    a. Locate the plane's center of gravity.

    b. The pilot saw the gravity of the situation.

Speaking and Listening

1. Make a model airplane and describe or demonstrate to the class just how you put it together.

2. Tell the class about a movie you have seen, a radio program you have heard, or a book or an article you have read that concerns some phase of aviation.

[illegible]

[illegible]

[illegible]

3. Explain the advantages of one type of plane over another for different purposes, and try to keep them in their classes, as, commercial planes, seaplanes, transports, fighters, bombers, etc.

4. Show how Sikorsky is indebted to DaVinci and others with regard to his experiments with the helicopter.

5. Give a talk on how aircraft have changed our way of life; include a decision of how they may change our future.

(Note: Students should be required to take notes on all reports given in class.)

Reading and Writing

1. Prepare written reports on books, fiction or nonfiction, dealing with aviation.

2. Build an aviation bibliography as a valuable reference for reading in general and also for use in preparing reports.

3. Make an aviation scrapbook, using up-to-date news clippings, magazines, pamphlets, etc. Also illustrate with your own drawings and sketches.

4. Help maintain an up-to-date classroom aviation shelf by bringing in all literature pertaining to aviation.

5. Choose any of the following topics to write about:

   a. What contributions may aviation make to the peace ?

   b. A biography of a famous aviator or aviatrix.

   c. How air speed reduces pressure or why an airplane flies.

   d. How to get in the Air Forces.

   e. An original drama (play, movie, story, radio script), story, song, poem, etc. dealing with some phase of aviation.

   f. How can aviation help us to understand and be friends with people who live in other countries ?

g. What the aircraft of the future may be.

h. The art of flying or the science of aviation.

i. The use of air transportation has made the world much smaller.... 1/

Another activity, which includes English, spelling, business arithmetic, and some idea of business operations, is presented in "Turning a Schoolroom into an Airline Office" by Ruth Mikich.[2/] Even though this, like the English activities just mentioned, was done in a senior high school, it could be easily adapted to the junior-high-school level.

> The pupils.....'operated' a commercial airline. One week was spent preparing and setting up the business. Classes were combined, materials were procured....records set up, and personnel selected. Everyone joined in advertising the business throughout the school....
>
> The entire school building was used for the project. Small conference rooms were used for private offices. ....The school office was the main ticket office, the gymnasium was the hangar, and a small room off the gymnasium was the repair shop.... Signs, maps, and advertisements were hung throughout the building. ....
>
> Many incidents of an airline business were brought into the organization. Planes failed to depart on schedule because of bad weather, thus causing the rerouting of passengers on trains and busses. Reservations were made; cancellations recorded; complaints calmed.

1/Edward J. Rutan, Ibid.

2/ Ruth B. Mikich, "Turning a Schoolroom into an Airline Office," Business Education World, January, 1945.

[illegible]

4. Contributions through Social Studies:-- Activities in the social studies could consist of pupil research, guided by the teacher to proper sources, on the effect of aviation on cities in the near future--comparing the possible change with that produced by other means of transportation in earlier times; reporting on economic effects which may occur, problems of government and politics, and the importance and comparative accuracy of different types of maps.

Pupils at the junior-high-school level could do a great deal more reference reading than they do and could easily find information showing how the growth and decline of countless cities were determined by caravan routes, highways, sailing vessels, railways, and steamships; and how the development of a new form of transportation caused the rise in importance of some cities and the decline into insignificance of others.

With the coming of aviation as an important method of transportation,

> Every city is now a possible port of call for planes that may come from any part of the world. Planes from Europe may fly directly to Chicago or Kansas City. Minneapolis may become a great world 'port' with regular service to both Asia and Europe. Denver, Vladivostock, and ten thousand communities like them are as aerially important as New York, Paris or Moscow.....Guam and Wake Island, once insignificant coral formations, became indispensable way stations when clippers began to fly across the Pacific. Iceland, Bermuda, and the Azores no longer lie off the beaten track; they are coveted as stepping-stones..... In a sense, the history of the ancient trade routes is repeated-- the history of communities that owed their prosperity to the caravans that once passed through them. The caravans today have wings. Mountains,

c. Contradictory Concept Value Analysis:-- Activities in the social structure would consist of small research, policies by the teacher to develop concepts, or the effect of activities on either in the same groups--regarding the principle through this shall proceed in three areas of investigation: in activities; concerning on economic effects of such work, problems of government and activities, and the importance and consequences involved in different forms of work.

Thus in the (motor-skill-social) level work in a social test more reference reading that does do not much exactly this information should be the speed and position of activities other work activities of concerned forms, clearness, policies, remarks, politics, and therefore; and our the development of a new fact of the activities should the idea is teacher or some other and the studies life independence in school.

With the social activities is a transfer values or transparency.

Among why is one a possible, and of well for places that may come from the part of the world. Social [illegible] the difficult to achieve or [illegible] [illegible] to work life of school. Better [illegible] and for focused [illegible] or a [illegible] activities' in the [illegible] work or [illegible] [illegible] [illegible]

> oceans, shore lines, deserts- these are no longer serious obstacles to free movement. 1/

The preceding quotation suggests a possible core of information which pupils in social studies classes could look up and work out in specific detail, considering also the effects of aviation on global economy and the necessity of speedier business methods.

In studying the national economies of various countries, the pupils would learn much from tracing the development of commercial aviation in those countries, since in recent years the rapid growth in trade in countries like Alaska, Canada, and countries in South America is due in no small measure to air transport.

Kaempffert 2/ reports that....

> South America has forty-four airline companies; the United States only 18 (in 1943). Although South American planes flew only one quarter as many air-miles as those of the United States in 1940, they covered a network two and a half times greater than ours and transported six and a half times more cargo(in pounds) than did our lines. Yet their passenger traffic was only one-sixth as great as ours.

1/ Waldemar Kaempffert, "The Airplane and Tomorrow's World," Public Affairs Pamphlets, No. 78, 1944, pp.6-8.

2/ Ibid., p.11.

The pupils would gain a much greater conception of the topography of areas in South America and the Soviet Union, to mention only two examples, by finding out the reasons for the development of air-cargo transport in those regions. They would realize how mountains, jungles, vast swamps, deserts, and barren areas have blocked surface transportation and impeded the development of interior sections which came to be exploited only with the arrival of the airplane. For example,

> Through the service of Lloyd Aero Boliviana(LAB) Bolivia is passing directly from the llama, pack horse, and mule to the plane, and this for the reason that railway and highway communication between the plateau(12,000 feet) and the lowland is virtually non-existent. ....There is nothing extraordinary in this sudden transition of Latin America or of the Far East, Alaska, and northern Russia from the most primitive to the most modern of conveyances..... 1/

Further social concepts will be developed by the students in reading and discussing what the air-terminal city of the future may be like and in comparing it to present railway-terminal cities.

The politics and the national feelings in regard to "Who Owns the Air?" 2/ and how high up is it owned make thought-provoking material for social-studies classes.

1/ Kaempffert, Ibid., p.13.

2/ Ibid., pp.23-29.

To quote Kaempffert[1] again:

> The architects of the new world order are all agreed that there must be some yielding of sovereign rights, some willingness to accept the decrees of a central administration, if another devastating war is to be avoided. That yielding becomes all the more necessary, if the international airplane is to bring people together who are far apart culturally, politically, and racially....
>
> The sovereign right that most urgently needs modification so far as the airplane is concerned, is the one expressing the doctrine that a nation owns not only its soil to the center of the earth, but the air to an infinite height above.

In searching out reasons for the above statements and much similar material, the pupils would, undoubtedly develop a more concrete world-consciousness than that which is developed in traditional social-studies classes.

Activities to improve the pupils' map understanding have an important place in any social-studies program, but are all too often completely neglected-- pupils leaving school with a slight acquaintance with the Mercator projection only. The Mercator projection, devised for the aid of ocean navigators, makes it difficult to understand great circle routes and such statements as "North to the Orient".... Working with globes, polar projections, and other types of maps is an essential activity to produce an air-age understanding.

1/ Waldemar Kaempffert, op. cit., p.23.

Polar projections are now particularly important, because,

> ....We must learn to think of the northern and the southern hemispheres [instead of eastern and western], partly because the Russians have demonstrated the practicability of transpolar flying, partly because the short-route to much of Europe and Asia lies over the North Pole, and partly because three-quarters of the earth's land lies in the northern hemisphere.[1]

An article entitled "Making Your Own Air-Age Maps",[2] suggests the following activity:

> ....A team of two pupils can work together, one measuring on the globe, the other recording. Then each can make his own individual map from these calculations. Maps can be centered at any point on the earth, and so may be focussed on major cities to study air-age locational advantages, world air trading zones, specific great-circle routes, and other aspects of air-age geography. The best motivation, however, would come from having the pupils make a map centered on their home towns, wherever they may be. They may then see distances, directions, routes, trade, and locations of other countries,-- all in relation to the spot where they themselves are. They will enjoy selecting some place thousands of miles away from them, perhaps thinking of young Russian or Indian pupils, and drawing a map centered on that spot so that they can see how the world and their own location appear to a young Russian boy....

5. Contributions through Guidance.-- In the field of guidance or in vocational education classes there is ample opportunity for pupils to acquaint themselves with all the possibilities for employment in aviation. Reading and discussing job descriptions such as those which are presented by

1/ Waldemar Kaempffert, op. cit., pp.4-5.

2/ (Waldemar Kaempffert,) "Making Your Own Air-Age Maps", Air Age Education News, September, 1945, pp.8-9.

Smith and Engelhardt in "Opportunities for Youth in Air Transportation", [1] actual visits to airports and meeting airline personnel, and picking out preparatory courses to take in high school are all activities which would aid some pupils in vocational or in leisure-time guidance.

6. Contributions through Science.-- Not to be overlooked, of course, are the activities which may be best performed in conjunction with science classes, although many of these may overlap other subjects, especially arithmetic or geography. One activity suggested in Air Age Education News [2] is that of a project which would give the pupils a general understanding of climates, latitude and longitude, navigation, and other topics related to geography or science.

In this project,

> Each pupil takes two trips around the world by air. One trip starts from New York City and moves westward, following a definite latitude. The other trip starts at the North Pole and moves southward along a definite longitude.
>
> The pupil makes a survey of the countries he passes over, and stops to visit some of them. From these trips he learns something about latitude and longitude, time belts, zones of temperature, climate and clothing, citizenship, industries, and the importance of the places visited.
>
> The project requires a good global map. This permits many original methods of writing up a trip. Each pupil keeps a notebook which includes textbook notes, outside readings, and pictures. [3]

1/ Frances A. Smith, N.L. Engelhardt, Jr., "Opportunities for Youth in Air Transportation", Air Age Education Research, 1944, 32 pp.

2/ (Frances A. Smith, N.L. Engelhardt, Jr.) "Air-Age Workshop", Air Age Education News, March-April, 1946, p.23.

3/ Ibid.

Other activities that are frequently performed in science classes are those that consist of the following:

1. Taking obervations of the weather and cloud formations and keeping records of them.
2. Learning how to read weather maps and developing an understanding of "fronts", "masses", isobars, isotherms, and important symbols used on these types of maps.
3. Constructing model planes and gliders.
4. Reading about and illustrating the various methods of navigation- contact, dead reckoning, radio navigation, and celestial navigation(under which could be included further activities in observing stars and constellations).
5. Interpreting aeronautical charts.
6. Looking up and explaining the functions of various instruments used in flying, such as the air-speed indicator, rate-of-climb indicator, horizon indicator, and different types of compasses.

Recognition and classification of different types of aircraft, both heavier-than-air and lighter-than-air, provide varying types of activities perhaps best suited to science classes. Also adaptable to science classes are activities such as making miniature wind tunnels and diagrams and graphs, which are excellent means of clearly picturing the forces that act upon an airplane in flight- thrust, drag, lift, gravity- and show what keeps up the airplane.

MATERIALS

The mention of materials brings to mind two interpretations of the word :

A. The actual subject material presented to the pupil.

B. The equipment, commercial and individual, utilized to present information to the pupil.

A. Since this service paper does not purport to present in detail the materials to be included in the entire aviation program, but rather the place of different materials in the total curriculum, only the major areas of aviation will be listed, with suggestions in regard to where they might best be placed in relation to other subjects.

1. AERODYNAMICS

The question "What makes an airplane fly?" may perhaps best be solved in science classes, with related reference readings in English and problems in arithmetic, such as those involving comparisons between different forces and control surfaces.

2. METEOROLOGY

How the sun makes weather, formation of types of clouds, what determines air masses and fronts, and winds are all topics that

[illegible]

The activities of [illegible] Indian [illegible] and [illegible] [illegible] [illegible] :

1. The normal [illegible] [illegible] [illegible]

probably best lend themselves to science classes. The effect of the earth's rotation and angle of inclination on weather and climate is a topic often included in geography classes. Other topics which seem adaptable to both science and arithmetic classes are: temperature and pressure, the sun's radiation, measurement of atmospheric conditions, and the weight of air.

3. SOCIAL CONCEPTS OF AVIATION

(These are based on Engelhardt's booklet, "Into the Air Age" 1/)

a. "The Contributions of Flight to Civilization"

> Today.... we are confronted with the fact that 250-mile-an-hour airliners mean that the largest centers in the world and most of the world's population are less than a day's travel from the United States.
>
> The airplane travels through an air ocean without boundaries. It is not handicapped by barriers of mountain ranges, coast lines, arctic wastes, or deserts. It is free to move from any point on the earth to any other point regardless of intervening terrain or obstruction to earthbound travel.
>
> As we enter the Air Age, the importance of these physical barriers is diminishing. Because these barriers have

1/ N.L. Engelhardt, Jr., Into the Air Age, New York: Air Age Education Research, 1944, 32 pp.

provide best land conditions to achieve economic objects of the society's relations and modes of production in material life and ultimate life in their entire totality in developing elements. Other factors which seem important to deal religious and scientific objects etc: Transports and growth, the social religion, relationship of economic conditions, and the weight of all.

c. Social Elements in History

Theses are based on Engelsmeyer's conclusions, "Does the life have" [14])

e. "The relationships of Hitler to Christianity"

Theses.... We are confronted with the fact that Pan-German-Race activists and that the Teutonic ancestry in the world was most of the society's conditions are less than a man's thought than the Nordic Christ.

The activing levels according to anti-Roman religion's beneficiaries. It is not indebtedness to interiors of monotheistic religions, Jewish masses, or Bolshevik. It is also to write from our point on the north to the cross point respecting of interpreting Christ or determination in authoritarian theses.

In our opinion the life type, and the predominance of that religional interpretations is individual. Jesuism Jewish ancestry.

[14]. Engelsmeyer, Jesus und die Juden, Der Judenchristliche Messianismus, Leipzig, 1933.

> prevented the full development of the world dependent on sea and overland transport, people have gathered largely along accessible seacoasts. The vast resources of the continental interiors--inland Africa, South America, Asia, Russia, and northern Canada- remain to be developed by air transportation.
>
> The use of air is creating new frontiers for the expansion of the habitable areas of the globe. No longer are there any boundaries of a physical nature to stand in the way of man's progress in the development of the world's resources for his greatest benefit.

The above concepts are probably most suitable for their presentation in social-studies classes.

b. "Impacts on Communities"

> The great metropolitan centers of the world have become so much a part of civilization that the tendency is to consider them as fixed entities. Actually, they have developed in a world of sea and land transportation and now, in the air world, their values need to be reconsidered. ....The effect of air transportation on the growth of our large cities is only beginning to be felt. This new method of travel and shipping will open up the vast rural areas for factories and home development. It will reduce the congestion of metropolitan centers.
>
> Many industrialists, real estate specialists, and community planners are aware that we are already beginning to experience a wave of decentralization as a result of the growth of aviation..... Decentralization appears to be a necessity in the air age. Military security requires that we have no highly congested areas or concentrated industry which can be made the object of air raids. Industry and population should be spread out....

> Decentralization may also be a matter of economy and good business in the Air Age. Industrial competition will be heightened by the speed of air transportation. The greatest advantages will be secured by industries which are located alongside a landing field.

The concepts provided in the above material are also social-studies problems.

The following material is well suited for discussion in science classes.

c. "Impacts on Technology"

> Today the airplane has in itself become an attainment from which will flow many new advancements for technological civilization. It will speed up the processes of scientific development. It will increase the tempo of scientific achievements in many fields. New forms of transportation have always brought about important impacts on the development of industry. ....
>
> Industries allied to aviation will also grow. Such industries include those which will manufacture and fabricate aluminum, magnesium, beryllium, plastics, and fabrics. Oil, rubber, machine tools, engines, and radios are basic materials for aviation and will expand under the impetus of the growth of the industry..... Strong metals of light weight are vital to aeronautical advance, and technological skill has been employed to create alloys that are unbelievably light and strong..... Plastics also are used extensively in aircraft.....
>
> Perhaps even more important than the use of these materials in airplanes is the stimulation which is given to the application of these materials to many other uses. Aviation is the catapult for great technological advances of lightweight materials in the Air Age.

d. "Impacts on the Arts"

> When people begin to express their thoughts on the Air Age in poetry, architecture, painting and music, it can be said, and only then, that they have grasped the full significance of flight.....
>
> In the Air Age travel will be within the reach of more people than ever before. This implies an enlarged acquaintanceship with customs, arts, and handicrafts. From this commingling will rise new creative incentives to meet the impact brought by the presence of a vast potential audience. Cultures will spread with the exchange and enlargement of knowledge and understanding. ....

The effects of aviation on different aspects of art are materials that may be adapted to consideration in art classes, literature, and social studies.

Questions which Engelhardt [1/] raises for discussion, and social studies classes are perhaps the most logical situations for these, namely:

e. "Political Implications"

Who owns the air ?

Can the organization of an earthbound world be continued in the Air Age ?

What kind of world organization should we strive for in the Air Age ?

Does the use of global air favor our philosophy of free enterprise ?

Should the United States create one huge company to operate all of our world-wide air services or should we encourage more than one company to fly world routes under the American flag ?

1/ N.L. Engelhardt, Jr., op. cit.

d. Theories on the Type:

Some people begin to wonder that
theories on the life cycle in newly, semi-
tropical, planning and social, it can be
said, not only some, that they are vague
for the elucidation of things.....

So the air law trying will be within
the realm of more people than ever before.
This leaving to original and continuously
full systems, more, and headwaters. Some
this monitoring will view the leading
industries to meet the longest concept of
the year-round of a year [illegible] activity.
Nations will [illegible] with the economic and
[illegible] of [illegible] the [illegible].
....

The scheme of [illegible] in different [illegible] of air
are [illegible] that one of [illegible] [illegible] in one
[illegible], [illegible], and [illegible] [illegible].

Questions [illegible] [illegible] [illegible] [illegible] [illegible], and
social [illegible] [illegible] are [illegible] the [illegible] [illegible]
[illegible] [illegible], [illegible]):

a. Politics [illegible]

Can [illegible] the air -

Can the [illegible] of a [illegible] [illegible] be [illegible]
in the air law ?

What [illegible] [illegible] [illegible] [illegible] [illegible] in
the air law ?

Can the [illegible] of [illegible] air [illegible] [illegible] [illegible]
[illegible] ?

Should the [illegible] [illegible] [illegible] [illegible] [illegible] to
[illegible] all of [illegible] air [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
the [illegible] [illegible] ?

[illegible] [illegible], [illegible], [illegible].

> .... These questions are of vast importance as we step across the threshold of the Air Age. New responsibilities and attitudes toward world organization demand attention before we can fully realize the privileges which flight offers to civilization. The future of world affairs and our relations with other peoples will, in no small measure, be dependent on our ability to cope with the vast problems involved in the control and ownership of the air ocean.

4. AIR COMMUNICATIONS AND AIRLINE OPERATIONS

The subject material involved in these topics may be covered in sufficient detail for junior high school by reading and reports in English classes and some more technical information in science classes.

5. VOCABULARY

The including of aviation materials in the curriculum results in confronting the pupil suddenly with a maze of new words. These can, of course, be taken up in each class as they are arrived at, but it might be more simple if pupils were prepared in English class by reading, looking up, and using new technical words.

6. AIR NAVIGATION

At junior-high-school level this does not need deep consideration; a general conception is all that is necessary Arithmetic classes might consider problems of measuring speed and altitude and determining direction. Science classes might

[illegible]

6. [illegible]

[illegible]

7. [illegible]

[illegible]

8. [illegible]

[illegible]

take up a simple understanding of celestial and radio navigation.

7. PHYSICAL AND BIOLOGICAL EFFECTS OF FLIGHT

Effects of high altitude and possibilities of diseases being spread by long distance flights are topics which in the junior high school could be taken in physiology classes or discussed in social studies classes.

Although there may be other major areas of aviation material, the preceding list is, I believe, comprehensive enough for most junior high school programs, and may be covered in as much detail as is feasible in the local situation.

B. There is such a vast amount of commercial equipment available that to attempt to report any significant portion of it here would be an effort beyond what this service paper purports to do.

An example of a comprehensive reference in aviation is The Aviation Education Source Book, prepared with the cooperation of the Civil Aeronautics Administration by a group of teachers and writers under the leadership of Dr. Paul R. Hanna, School of Education, Stanford University.

The Source Book is published by Hastings House, New York City, at eight dollars per copy. It has 855 pages that are eight and one-half inches by eleven inches, with annotated bibliography and more than a thousand charts, maps, graphs,

tain by a single manufacturer of similar and radio activities.

7. Effects of physiological systems of mission

Effects of high mobility and penetrability of diseases which spread by long distance flights are larger which is the major high school would be taken to physiology diseases or diseased in social mobile diseases.

Although there may be other major areas of research industrial, the preceding list is, I believe, comprehensive enough for most junior high school programs, and may be revised in a more logical or is therefore in the lower elementary.

8. There is quite a vast number of commercial equipment available that is offered to expand our elementary program or if one would be in effect having what life science laser equipment is.

A. Monthly of a commercially reference is available in the Science Teaching Index Card, covering with the information of the least expensive equipment by a group of learners and studies under the laboratory at a. Test 7. Green, Manual of Laboratory, Prentice Hall.

The Science area is problem to Central Tests, the task play, in a high activity per cent. If the all power that are single and non-part lesson or electric lamps, with laboratory difficulty and more than a chemical points, mass, etc.

diagrams, and photographs. This book includes many suggestions for the inclusion of pertinent aviation teaching materials in five basic fields: Social Studies, Science, Language Arts, Mathematics, and the Fine Arts- "all the essential aviation information in one comprehensive volume." Partial contents of the book, quoted from the brochure, are as follows:

For Social Studies:

> Modern air transportation; its influence on the lives of all people, and the changes in cultural patterns brought about by it.

For Science:

> Weather and theory of flight; the design and construction of aircraft.

For Language Arts :

> Learning to speak, read and write about aviation.

For Mathematics:

> Dealing with quantitative problems using aviation data.

For the Fine Arts:

> Communicating aviation facts and feelings through graphic and plastic media.

Another example of valuable source material is the booklet published annually by the Air Transport Association of America entitled "Little Known Facts about the Scheduled Air Transport Industry" which contains many charts and graphs that would be of interest and aid to arithmetic and social-studies classes. The charts include such major areas as

[illegible], and [illegible]. This list includes [illegible] -
[illegible] for the [illegible] of [illegible] [illegible] [illegible] -
[illegible] in film media studies: [illegible] [illegible], [illegible], [illegible]
[illegible], [illegible], and the film [illegible] "All [illegible] [illegible]
[illegible] information is [illegible] [illegible]." [illegible]
[illegible] of the book, [illegible] from [illegible], are [illegible]:

For [illegible] [illegible]:

[illegible] air [illegible]; [illegible] on the [illegible]
of all [illegible], and [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible].

For [illegible]:

[illegible] [illegible] [illegible]; [illegible] [illegible] [illegible]
[illegible] of [illegible].

For [illegible] [illegible] :

[illegible] [illegible], [illegible] [illegible] [illegible] [illegible].

For [illegible]:

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible].

For [illegible] [illegible]:

[illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible].

[illegible] [illegible] of [illegible] [illegible] [illegible] in the
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
of [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
in [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]
[illegible] [illegible] [illegible] [illegible]. [illegible] [illegible] [illegible] [illegible]

these :

Total Passengers Carried

Passenger-Miles Flown

Revenue Miles Flown

Passenger Revenue

Air Mail-Miles Flown

Air Mail-Route Miles

Air Express Pound Miles Flown

Air Express Pounds Carried

Air Express Revenue

Plane Operations

Equipment

Fuel Consumption

Airports-Tentative Classification

Safety Records-Total Miles Flown and Total Accidents in Carrier Operations

Material to impress the pupil with the safety of modern commercial flying deserves an important place in the junior-high-school curriculum. Parsons [1] suggests providing the pupil with material to work out facts such as this: a child aged ten could commute between New York City and Chicago each day for 82 years before losing his life. (By dividing the distance into the number of passenger miles per fatal accident)

1/ Richard T. Parsons, "Education Faces the Air-Age", Education, 64:595-99.

Table :

Total Commercial Service

Transcontinental-Atlantic Flow

Domestic (Air) Flow

Transcontinental Transport

Air-Rail-Sea Flow

Air Rail-Sea Flow

Air Express Sea Flow

Air Express Rail Sea Flow

Air Express Rail Sea Transport

Air Express Sea Transport

Air Express Transport

Sea Express

Sea Express Transport

Airport-Airport Transshipment

Rail Transshipment

Rail Transshipment Flow and Air Sea Transshipment

Air Express Transshipment

Selected to compare the mean of the factor of Sector commercial flying business or operation, such as air passenger-airport terminal. Because [4] equipment [illegible] small with material to move and from one or two; a year and the small operate between the air ship or change was for the 30 years since leaving the site. The leaving the future lack the number of transport flow the total equipment [illegible] transport. Therefore based the air-cargo operation, airport.

Parsons also believes in acquainting the pupil with the size of the aviation industry and presenting material to show the pupil that it is a twenty billion dollar industry employing two and one-half million people.

The commercial airlines of the United States offer a tremendous amount of free material for use as teaching aids. Typical of these offers is that of TWA Air World Education Service advertisements asking teachers to write for teaching aids for Social Science, Aeronautical Science, Airline Job Opportunities, and Educational Tours. Other major airlines offer also many free materials like colorful booklets, pictures, maps, and charts- all to be had just for the asking.

Perhaps the most important single source of aviation material is Air Age Education Research, 100 East 42nd Street, New York City. The purpose of this organization is to help provide teachers with access to free and inexpensive aviation teaching materials.

As a means of acquainting teachers with what is available, Air Age Education Research publishes catalogs listing up-to-date materials in aviation in various forms, including picture charts, maps and globes, booklets, and many photographs, posters, and colored prints. Also offered at small expense are comprehensive classroom collections. Subscriptions to Air Age Education News, referred to previously, are given free to all who write and ask. Contained in this free periodical are many helpful materials-"News of the Air World",

[illegible] and relative i[illegible] the [illegible] [illegible] of the artistic [illegible] and [illegible] [illegible] to [illegible] [illegible] that it is a [illegible] artist [illegible] [illegible] [illegible]

"Air-Age Workshop", articles by well-known authorities, and reports on what is being done to further aviation education.

Metcalfe [1/] recommends the use of visual aids as much as possible to speed up the teaching of the principles and the practices of aviation and to make some of aviation's more or less complex ideas understandable more quickly by means of movies, film strips, slides, photographs, diagrams, and charts.

Most of the aviation films produced by the Army, Army Air Forces, and Navy, however, are much too technical and advanced for junior high school. It is, therefore, in the field of visual aids that there is the greatest need for teacher and pupils to create original simplified materials for this level in the shape of project drawings, diagrams, models, and slides.

A variety of aviation education equipment is sold by the Denoyer-Geppert Company of Chicago. Listed are such items as these :

Map Reading Charts

Student's Map Reading Handbook

Meteorology Charts

Air Age Cradle Globes

Polar Air Age World Map

Wall and Desk Outline Maps

1/ Lyne S. Metcalfe, "All Eyes on Aviation", School Executive, 62:58.

tale-like fantasy", written by well-known authorities, and supports a view in which some of artistic origins nonsense.

Antolik[1] concerning the use of short-cut in work is unable to speak by the teaching of the principles and the conditions of artistic and is said some of artistic's work or look superior items unintelligible were priority of years of review, film-lining, title, photography, lighting, and sound.

Tool of his artistic talent produced by the jump, jump air frames, and bars, however, the small tool technical was unfamed for junior high school. It is, therefore, in the field of sound that they have to be greatness used for the-day and which in drawing original simplified-material. For this lacks in the needs of project, lighting, sound, and video.

A variety of artistic adventure equipment in said in the Project-report designed of science. Listed are much items as follows :

Dry Cooling Towels

Graham's Jam Making Handbook

Dehumidifying Towels

Air Gun Cleaning Cloths

Solar Cir Gas Stand Set

Bell and Dual Motion Jaws

[1] Jack T. Antolik, "All Hand on Deck", School Shop, 1:14.

Other companies, of course, are offering similar material. The above was selected merely as a representative sample of what material is obtainable.

Parts of these materials may be considered by some as too advanced for junior high school, but it seems that this is the level where pupils should begin to get a conception, no matter how general or simple, of the different problems that are concerned in aviation. This general understanding can probably be much more quickly and clearly arrived at by the intelligent use of various forms of equipment, which will stimulate pupil interest while at the same time emphasizing pertinent facts and information to be retained by the pupil.

METHODS

Methods of teaching aviation material may be considerably improved by heeding the experience of the Air Force Schools, which have been a proving ground for educational policies in aviation.

Greer,[1/] in "Educational Lessons from the Air Force", states,

> The Air Force School has found that it is futile to teach masses of detailed information.... Best results have been obtained where the fundamentals of a problem have been explained and stressed-then mastered by the student. The Air Force experience suggests that in the public schools the curriculum always should be concerned with the large, basic, simple facts and operations. ....

1/ Thomas H. Greer, "Educational Lessons from the Air Force", California Journal of Secondary Education, 19:224-9.

other occasions, of course, the activities involved inter-
ial. The above are intended merely as a representative sample
of such material in existence.

Some of these materials can be considered by some to
be affected by Dwight Long's report, but I believe that this
is the level where media should begin to get a consideration,
to follow the general or simple, of the different problems
that are addressed in writing. This general understanding
of probably is such more clarity and clearer written as to
the institutions has of various forms of government, which also
clarifies well information with of the same time accessibility
movement there the information is to material by the press.

Conclusion

Reports of research using existing material can be considerably
improved by limiting the knowledge of the air force academy,
which comes from a greater number for educational activities in
existence.

Some, in conversation, assume from the air force's
studies,

> [illegible] the air force's [illegible] that is [illegible]
> [illegible] ... [illegible]
> [illegible] a [illegible] and [illegible]
> [illegible] the [illegible] the [illegible]
> [illegible] the [illegible] with the
> [illegible] ....

[illegible], Chaney, Educational research for the air academy,
[illegible] of [illegible], [illegible].

> The subject matter.... should be directed toward developing and reenforcing a relatively small number of basic skills or understandings.

Bellerue [1] believes that good aviation methods should begin with the teacher acquiring a rich background in aeronautics. She suggests that the teacher visit an airport, become acquainted with the personnel, fly, visit an aeronautical school, and collect materials. This experience should greatly aid the teacher in organizing and presenting the material in the classroom.

According to Aiken,[2] aviation beginning with the junior high school might well be approached from the viewpoint of occupational possibilities. This might not be practical in all situations, of course, but even so, some information on occupational possibilities should be given.

An evaluation of aviation education is made by Fuller [3] in "Aviation in the Schools". Although his article is not primarily concerned with methods, the following paragraphs may be considered applicable to this area.

1/ Alberta Bellerue, "Aviation ABC's", School Executive, 62:22-23.

2/ M.L. Aiken, "Air Age Education in the Secondary Schools", National Association of Secondary School Principals Bulletin, 28:101-117.

3/ Edgar S. Fuller, "Aviation in the Schools", Air Education News, January, 1946, pp.3-11.

> Educators have agreed generally that aviation education in the elementary schools means the modernization of study in terms of the Air Age. Typically, there are some short aviation-centered units of study, but no separate courses in aviation.
>
> In traditional type schools, we may say that appropriate aviation materials are incorporated into school subjects such as arithmetic, science, geography, or language. In the 'child-centered' school, of the more 'progressive' type, the programs are described differently. Here it is said that 'pupil activities concerned with aviation result in functional learnings which assist the child to develop satisfactorily in his environment'.....
>
> Specialized instruction such as aircraft identification and code have been dropped, and emphasis on specialized and little-used portions of navigation, meteorology, aerodynamics, and power plants has declined.....The trend is for teachers to avoid vague speculation about the social, political, and economic implications of aviation in favor of some specific study of just how aviation does affect us.

A method of providing aviation information to pupils is that of subscribing to a paper such as, "Current Aviation", published weekly during the school year by the Educational Printing House, Columbus, Ohio. This paper is well adapted to use in junior-high-school classes. Furnishing pamphlets, like the "Exploring Aviation" series is another method well suited to junior-high-school level in conjunction with class work. "Exploring Aviation" is published serially by the Extension Division of the University of Nebraska in cooperation with the Teachers College.

The topic of METHODS has been considered here in a general, overall interpretation, not concerned with the

details of presentation, which is an individual matter with each teacher.

Methods and activities are, of course, greatly overlapping areas, and for this reason there may be listed under ACTIVITIES many procedures which might quite properly be called methods. It is not my intention to try to divide the field of aviation education into definite separate areas, but rather to make suggestions for improving aviation teaching grouped loosely into major areas for purposes of presentation.

In closing Chapter II, a list of sources and promotional organizations, furnishing suggestions for activities, materials, and methods for aviation education, is quoted from an article called, "Air Education Spreads." 1/

Aviation Education Division of the Civil Aeronautics Administration

Air-Age Education Research- sponsored by American Airlines

School and College Service- sponsored by United Airlines

Air Age Education, Inc.

Aviation Education Foundation

Civil Air Patrol

1/"Air Education Spreads," National Association of Secondary Schools Principals Bulletin, January, 1946 30:84-7.

[illegible] of [illegible], [illegible] is [illegible] [illegible] [illegible] [illegible] [illegible].

[illegible] and [illegible], [illegible], [illegible], [illegible] [illegible], [illegible] [illegible] [illegible] [illegible]

Educational Service of Pan-American World Airways

Air-Age Education Congress

National Aeronautics Association

Academy of Model Aeronautics

Air Power League

Aeronautic Training Society

Army Air Forces

Institute of the Aeronautical Sciences

Air Scout Program of the Boy Scouts of America

-And other less important or more technical organizations, but all with the common aim of improving aviation understanding.

CHAPTER III

SUMMARY AND RECOMMENDATIONS FOR AVIATION IN THE JUNIOR-HIGH-SCHOOL CURRICULUM

CHAPTER III

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General opinion expressed by various authors concerning aviation education at the junior-high-school level seems to favor the inclusion of aviation information within the framework of the subjects already making up the curriculum, rather than teaching aeronautics as a separate subject, which may well be a worthwhile practice at senior-high or trade-school levels, but not at junior-high level.

A report by Dr. John W. Studebaker, United States Commissioner of Education, referred to in an article entitled, "Education in the Field of Aviation" [1/] states that a national survey shows, "Education has not kept pace with the rapid development and progress in the field of aviation" and suggests that some means be found for improving this situation.

1/ "Education in the Field of Aviation", School and Society, 49:334-5.

Renner [1] recommends that "our whole education.... be revised to fit an 'air age'....We must 'air-condition'every young American..... We must 'geographically condition' him too. .... [Aviation] necessitates a very great shift in the emphasis and teaching aims of many school subjects."

Continuing the idea of revising present school subjects, a "Common-Sense View of Aviation Study" is expressed by Lindsay, [2] who says that he thinks that aviation may mean the reassessment of every subject, including the place of science in the pupil's program of studies, and the bringing of arithmetic and science courses up-to-date and connected with modern technology, and also emphasizing health instruction more than before.

The need for a general aviation knowledge is summarized by Givens. [3] He claims that traditional subjects should be stimulated or revised by means of aviation material. Technical and pre-flight training may be all right for the last two years of high school or vocational school, but long before then we should begin the development of attitudes and fairly comprehensive general knowledge of aviation- because " the challenge of the air-age is not restricted solely to those who would build and operate and service the airplane and the

1/George T. Renner, "Air-mindedness Programs in Schools", Teachers College Record, 44:247-9.

2/ Frank B. Lindsay, "Common-Sense View of Aviation Study", California Journal of Secondary Education,19:283-6.

3/ William E. Givens, "Air Lanes and Education", Education, 64:590-4.

[illegible]

[illegible]

[illegible]

flying field."

Fuller[1/] believes that the pre-high-school child should be made aware of such matters as these :

The types of aircraft

The parts of the aircraft and how they work

How and why aircraft fly

Their uses in carrying passengers, mail, and cargo

Other uses such as rescue work, fire patrol, or cotton dusting

How the airplane has changed ideas about geography

Requirements for airports and other facilities

A little about air traffic rules

Requirements for pilots and aviation workers

How flight affects the human body

Some understandings about how aviation affects communities.

An impression that military air power and international air transportation are very important for our country and for the world.

Andrews[2/] in discussing the Air-Age Congress meeting at Denver in the summer of 1945, reports that educators pointed

1/ Fuller, op. cit., p.10.

2/ John Paul Andrews, "Are We Ready to Fly?" Air Age Education News, (January,1946),p.9.

Flying Field.

Pilots' quarters and the pre-flight-school unit would be made [illegible] with [illegible] as follows :

(1) Types of aircraft

(2) Number of [illegible] and the [illegible]

(3) [illegible] [illegible]

(4) [illegible] [illegible], [illegible], and [illegible]

(5) [illegible] [illegible], [illegible], or [illegible]

(6) [illegible] [illegible] [illegible]

(7) [illegible] [illegible] [illegible]

(8) [illegible] [illegible] [illegible]

(9) [illegible] [illegible] [illegible]

(10) [illegible] [illegible] [illegible]

(11) [illegible] [illegible] [illegible]

(12) [illegible] [illegible] [illegible]

(13) [illegible] [illegible] [illegible]

(14) [illegible] [illegible] [illegible]

(15) [illegible] [illegible] [illegible]

up several specific problems resulting from widespread air travel which pupils, even below high school should be made conscious of. Two of these are:

> Disease traditionally borne by flying insects may well continue to travel by air. Thus, the rarest tropical disease may, in sixty hours, be carried by air travelers to the heart of New York City. What precautions can global airlines take to prevent world-wide epidemics ? ....Airlines will regularly fly nonstop between northern and southern cities of the United States, yet payload problems make passenger segregation impossible. With more and more travelers deserting the railroads for the airlines, will the airplane be used to perpetuate or to prevent racial discrimination ?

Apparently many educators do not think that problems such as these mentioned above are too advanced for consideration in the junior-high-school curriculum in conjunction with other subjects.

That it is an obligation to youth to adapt the curriculum to include various phases of aviation is stated by Engelhardt[1/] for the following reasons:

> Throughout history, the form and content of education has reflected the environment, culture, experiences, and hopes of people. Changes in education in the life of a particular people represent responses to new demands in the mode of living. In the past, these changes in our way of life have occurred slowly. But as technology advances, there is an acceleration in the rate at which important and revolutionary changes occur. It is a matter of vital concern, therefore, that encouragement be given to the adaptation of educational programs to

1/ N.L. Engelhardt,Jr., op. cit.

> the increasing tempo of alterations in our technological society. Many changes which educators will wish to evaluate are concomitants of the development of flight.

In conclusion, it appears to be the consensus of opinion that the overall aim of aviation in the junior-high-school curriculum is that all pupils achieve a fair amount of general knowledge and comprehensive attitudes and understandings concerning aviation by means of placing aviation materials within, and in addition to, the regular courses of study- not by teaching it as a separate subject.

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